

<b>Notice of Allowability</b>	Application No.	Applicant(s)
	10/656,775	BENNETT ET AL.
	Examiner	Art Unit
	John Juba, Jr.	2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTO-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1.  This communication is responsive to interview conducted December 6, 2004.

2.  The allowed claim(s) is/are 1-24.

3.  The drawings filed on \_\_\_\_\_ are accepted by the Examiner.

4.  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)  All    b)  Some\*    c)  None    of the:

1.  Certified copies of the priority documents have been received.

2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3.  Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5.  A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6.  CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.

(a)  including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached  
1)  hereto or 2)  to Paper No./Mail Date \_\_\_\_\_.

(b)  including changes required by the attached Examiner's Amendment / Comment or in the Office action of  
Paper No./Mail Date \_\_\_\_\_.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7.  DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- 1.  Notice of References Cited (PTO-892)
- 2.  Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3.  Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
- 4.  Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
- 5.  Notice of Informal Patent Application (PTO-152)
- 6.  Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_.
- 7.  Examiner's Amendment/Comment
- 8.  Examiner's Statement of Reasons for Allowance
- 9.  Other \_\_\_\_\_.

***Examiner's Amendment***

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Kenneth Pritchard on December 6, 2004.

**In the Claims:**

Claims 25 and 26 have been CANCELED.

Claims 1 – 17 and 19 – 24 STAND as originally filed.

Claim 18 now reads as follows:

18. (Currently Amended) An active/adaptive actuator for an adaptive optic mirror as described in Claim 17 [[14]] where said actuators are mounted between two push-pull rods to connect each actuator to its respective actuator holder and to said adaptive optic mirror.

***Restrictions***

Prior to examination on the merits, the examiner required restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1 - 12, drawn to a deformable mirror actuator with actuators, rotatable collars, and cooperating handles, classified in class 359, subclass 846.
- II. Claims 13 -24, drawn to a deformable mirror actuator with actuators, captive collars, and cooperating handles, classified in class 359, subclass 846.
- III. Claim 26, drawn to a piezo-electric linear actuator, classified in class 310, subclass 328.
- IV. Claim 25, drawn to a piezo-electric bimorph actuator, classified in class 310, subclass 330.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are unrelated, or at least patentably distinct species. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions are not disclosed as capable of use together, the respective assemblies have different modes of adjustment, and the handles have different functions. Further, the "holding plates" with rotatable *versus* captive collars are at least in mutually exclusive species relationship.

Inventions I and III are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because claim 1 evidences that the combination does not rely upon the details of the piezo-electric actuator design for patentability. The subcombination has separate utility such as a linear actuator for any of a variety of applications, such as in a micromanipulator.

Inventions I and IV are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention IV has separate utility such as in a support for a scanning mirror, or in a micromanipulator. See MPEP § 806.05(d). To the extent that the inventions may be regarded as being in combination-subcombination relationship (with the combination not actually claimed), then claim 1 evidences that the combination does not rely upon the details of the subcombination, and the subcombination has the separate utility noted above.

Inventions II and III are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the

particulars of the subcombination as claimed because claim 13 evidences that the combination does not rely upon the details of the piezo-electric actuator design for patentability. The subcombination has separate utility such as a linear actuator for any of a variety of applications, such as in a micromanipulator.

Inventions II and IV are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention IV has separate utility such as in a support for a scanning mirror, or in a micromanipulator. See MPEP § 806.05(d). To the extent that the inventions may be regarded as being in combination-subcombination relationship (with the combination not actually claimed), then claim 1 evidences that the combination does not rely upon the details of the subcombination, and the subcombination has the separate utility noted above.

Inventions III and IV are unrelated, or at least patentably distinct species. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions are not disclosed as capable of use together, and the respective actuators have different modes of operation (linear vs. bending).

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, and because the search required for Group IV is not required for Group III, restriction for examination purposes as indicated is proper.

**Within Groups I and II,** this application contained claims directed to the following patentably distinct species of the claimed invention.

If Group I is elected, then Applicants are required to elect one of the following patentably distinct species of materials:

Species a – cyanate ester composites, to which claims 2, 4, 8, and 10 are directed

Species b – carbon-silicon-carbon composites, to which claims 5, 6, 11, and 12 are directed.

If Group II is elected, then Applicants are required to elect one of the following patentably distinct species of materials:

Species c – cyanate ester composites, to which claims 13, 16, 18, 20, 22, and 24 were directed

Species d – carbon-silicon-carbon composites, to which claims 18 and 24 are currently directed.

Applicant was required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, within Group I, claim 1 is generic to species a & b; within Group II, claim 13 is generic to species c & d.

***Election***

During a telephone conversation with Mr. Kenneth Pritchard on December 3, 2004 a provisional election was made with traverse to prosecute the invention of Group I, Species a, claims 1 – 4 and 7 - 10. Claims 5, 6, 11, and 12 were withdrawn from consideration as being directed to a non-elected species, it being thought that there was no allowable generic claim. Claims 13 – 26 were withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Rejoinder***

After a search for Group I was performed, the examiner realized that the art was relevant to the invention of Group II as well as Group I. Since the two inventions differed only in elements "H" and "I", the examiner found no undue burden in considering both inventions, and these groups were rejoined. Both inventions were found to distinguish over the prior art, as set forth below.

***Reasons for Allowance***

The following is an examiner's statement of reasons for allowance: The prior art, taken alone or in combination, fails to teach or fairly suggest *in combination*, a plurality of actuators, actuator holders, differential threads, and support collars, further comprising

a first adjustment handle cooperating with the support collars and a second adjustment handle cooperating with the differential thread as particularly recited in claim 1; or

a plurality of first adjustment handles cooperating with the differential threads and a plurality of second handles cooperating with the actuator holders as particularly recited in claim 13.

The article cited in Applicants' Information Disclosure Statement is not prior art, but has an authorship that differs from the inventorship identified in the instant application. However, the article lacks a disclosure of a calibration mounting plate in combination with the illustrated holding plate. Thus, there is no evidence of *complete* conception of the invention by another entity as might warrant an inquiry regarding inventorship.

As to the prior art, the use of differential threads for fine positioning of optical elements was well known. However, the claimed subject matter as a *whole* is neither disclosed nor suggested in the prior art. For example, Haas, et al (U.S. Patent number 5,781,292) disclose movable mirror having a plurality of piezo-electric actuators (70) mounted to actuator holders (72), each threaded into a differential thread (120), each

threaded into a collar (116), the collar being free to rotate. However, if there is an identifiable first handle, it does not pass through holes in a calibration mounting plate, as recited for example in claim 1. Although the collar can be locked against rotation, there is no second adjustment handle cooperating as recited for example in claim 13. In any event, one of ordinary skill would not regard the mirror of Haas, et al as an "adaptive optic mirror". Hartman, et al (U.S. Patent number 4,408,832) disclose an adaptive optic mirror wherein one of a plurality of mirror actuators is supported by a frame, the actuator comprises a piezo stack (132) for adaptive mirror adjustment, and the stack interconnected with a plurality of threaded members (138)(139)(140) and cooperates with gripping sections (112)(116) and a stepping section (114) for static surface figure control. But, there are no adjustment handles.

The prior art further made of record and not relied upon is considered pertinent to applicant's disclosure.

Rumsey, et al (U.S. Patent number 6,219,082) disclose a differential screw arrangement for controlling the curvature of a deformable mirror.

Bennett, et al (U.S. Patent Appl. Pub. no. 2003/0147162 A1) suggest the use of a cyanate ester as the material of an adaptive mirror faceplate.

Ealey, et al (U.S. Patent number 5,037,190) disclose an adaptive optic mirror having a plurality of actuators threaded into a holding plate, the holding plate being joined with other plate members having holes in mutual alignment.

Heinz (U.S. Patent number 4,373,404) discloses a differential thread actuator useful for mirror positioning and having both a coarse and a fine adjustment mode.

Heinz (U.S. Patent number 4,295,710) discloses a deformable mirror having a plurality of threaded ball screw mirror actuators, each operating under the influence of a stepper motor and a piezo-electric actuator.

Brown, et al (U.S. Patent number 5,004,205) disclose differential threaded actuators for tip/tilt positioning of a mirror, and teach the use of threaded rollers as offering finer adjustment than threaded ball roller actuators.

D.J.G. Flower (GB 2,202,299 A) discloses a differential thread (Fig. 12) for use in a "differential micrometer" mechanism for tip/tilt adjustment of a mirror.

DIEHL GmbH & Co (DE 3502024 A1) disclose threaded adjustment means for a deformable mirror having actuators.

H.E. Bennett, et al (*AIP Conf. Proc.*) teach the use of cyanate ester composites for lightweight mirror faceplates and adaptive mirrors (2 articles).

SSG Precision Optronics, Inc (*NASA Tech Days 2002*) teach the use of silicon carbide for lightweight mirror faceplates and the use of fiber reinforced silicon carbon for lightweight mirror supporting structures.

R.E. Aldrich (*ADAPTIVE OPTICS ENGINEERING HANDBOOK*) discloses a variety of actuator technologies for adaptive mirrors.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Drawings***

New drawings were received on January 16, 2004. However, any replacement drawing sheet must be identified in the top margin as "Replacement Sheet" (37 CFR 1.121(d)) and include all of the figures appearing on the immediate prior version of the sheet, even though only one figure may be amended. Thus, these sheets were treated as proposed drawing changes. The proposed changes have been approved.

Corrected formal drawings are required in response to this Office action. The new drawings MUST be filed within the THREE MONTH shortened statutory period set for reply in the "Notice of Allowability." Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136 for filing the corrected drawings after the mailing of a Notice of Allowability.

***Information Disclosure Statement***

Applicants' I.D.S. filed September 4, 2003 has been considered. Since the reference was not listed on Office form PTO-1449 or equivalent, the reference will not appear on the face of any patent issuing from the instant application.

***Claim Numbering***

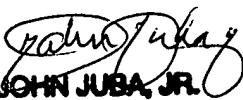
Claims 1, 2, 4, 10, 8, 3, 9, 5, 6, 12, 11, 7, 13, 14, 16, 22, 20, 15, 21, 17, 18, 24, 23, and 19 have been renumbered as 1 – 24 (respectively).

***Conclusion***

Post-allowance papers should be mailed to ***Box Issue Fee***. Post-allowance papers may also be faxed to correspondence branch in PUBs. The fax number is (703) 308-5083. The ***PUBs customer service*** number is (703) 305-8497.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (571) 272-2314. The examiner can normally be reached on Mon.-Fri. 9 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Drew Dunn whose number is (571) 272-2312 and who can be reached on Mon.- Thu., 9 – 5.



JOHN JUBA, JR.  
PRIMARY EXAMINER

Art Unit 2872

December 6, 2004